Citation:

Scaglioni S, Agostoni C, De Notaris R, Radaelli G, Radice N, Valenti M, Giovannini M, Riva E. Early macronutrient intake and overweight at five years of age. *Int J Obes.* 2000; 24: 777-781.

PubMed ID: 10878686

Study Design:

Cohort study.

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To examine the influences of the early intake of macronutrients on the development of overweight in healthy children.

Inclusion Criteria:

- Live births that occurred at the maternity ward in Milan, Italy during the second semester of 1991.
- Birth weight 2,500g or more
- Gestational age of 37 to 42 weeks
- Singleton birth
- No neonatal disease or congenital malformation
- Caucasian parents.

Exclusion Criteria:

At least one parent with debilitating infections, dysmetabolic or degenerative diseases, parental drug consumption.

Description of Study Protocol:

The analysis includes current information from the assessments at birth, one and five years of age, when the growth parameters were measured and the dietary habits evaluated. When children were one year old, mothers were further interviewed about infants' feeding practice in the previous period. Both parents were measured for weight and height.

Data Collection Summary:

Dependent

Overweight at five years of age (BMI based on measured height and weight following standardized protocols). Overweight was defined as BMI more than 90th percentile fore age- and sex-adjusted Rolland-Cachera curves (1982).

Independent

- Macronutrient intake (percent of total kcal) at one year of age (FFQ followed up with a 24-hour food recall to confirm serving sizes)
- Parental overweight (at least one parent with BMI more than 25).

Control Variables

Infant's gender, weight and length at birth and at one year of age and parental age (controlled for in multiple logistic analysis only).

Statistical Analysis

Student T-tests, non-parametric Wilcoxon and Mann-Whitney tests, multiple logistic analysis.

Description of Actual Data Sample:

- *Original sample:* 164 infants were included in the prospective study
- *Withdrawals/Drop-outs:* 17 children
- *Final sample:* 147 children (80 boys, 67 girls)
- *Race/Ethnicity:* Caucasian
- *Age:* One year at baseline and five years at follow-up.
- *Location:* Milan, Italy.

Summary of Results:

Longitudinal Results

- Children overweight at age five years ingested at one year a significantly higher percentage of energy as proteins (22% vs. 20%, $P<0.024$) and a lower percentage as carbohydrates than non-overweight children (44% vs. 47%, $P<0.031$)
- Fat intake (percent of total kcal) was comparable and slightly lower than 35% in both groups
- Total energy at age one year was not statistically different between overweight and non-overweight at five years of age
- Type of feeding at birth: Overweight at five years of age occurred in 21.8% of 124 breast-fed children, and in 30.4% of 23 bottle-fed children ($P=0.52$), with a difference in the group of 38 children born from overweight mothers (23.3% vs. 62.5%) approaching statistical significance ($P=0.08$).

Multiple Logistic Regression

- The multiple logistic regression identified parental BMI as the most relevant factor associated with overweight at five years of age (father's BMI, $P=0.003$; mother's BMI, $P=0.05$)
- Among macronutrients, only protein as a percentage of energy at one year was associated with overweight at five years ($P=0.05$)

- When compared to breast-fed children of overweight mothers, bottle-fed children of overweight mothers had a 2.68 greater risk of being overweight at five years of age.

Cross-sectional Results

At the age of five years, no significant difference was found between overweight and non-overweight children for any dietary nutrient.

Author Conclusion:

Parental overweight is a major risk factor for childhood overweight in the first years of life, but an early high protein intake may also influence the development of adiposity. Breastfeeding may play a positive role in the prevention of the development of overweight, especially in infants born to overweight mothers.

Reviewer Comments:

Strengths

- *Longitudinal design*
- *Dietary data collected by trained dietitian*
- *Heights and weights were measured by study staff (not self-report).*

Limitations

- *SES not specified*
- *17 infants lost to follow-up not described or accounted for by researchers*
- *There may be other factors not collected in this study that contribute more to childhood obesity than high protein intake.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	No
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	No
4.1.	Were follow-up methods described and the same for all groups?	No
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes

4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	No
4.4.	Were reasons for withdrawals similar across groups?	No
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	No
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes

7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	No
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	No
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	No
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	No
10.2.	Was the study free from apparent conflict of interest?	Yes